PROCESS FOR MAKING A VERSATILE CLAMPING DEVICE DESIGNED TO HOLD OBJECTS WITHOUT DAMAGING THEM, SUCH A DEVICE AND ITS USE

1. FIELD OF THE INVENTION

The present invention relates to a method of making a multipurpose clamping device designed to hold objects without damaging them, such a device and its use.

2. PRIOR ART

Among the clamping tools including two jaws, of which one can slide along a straight guide piece, some are totally bare of forceable pressing means, such as screws, eccentrics, springs, hydraulic means or the like. Thus Ralph K. Coffman has filed in 1945 a patent application to get the US patent No. 2,510,077 which discloses such a tool. Coffman's tool is characterized in that said guide piece comprises several (three on the drawings) parallel and distinct cylindrical rods distributed along the jaws depth, and said jaws are equipped at one of their ends with cork pads facing each other. On the other hand, the rods are laterally linked to each other by small bars at each of their ends, the central rod being tied to these small bars. Therefore said jaws are kept imprisoned between these said small end bars. It seems that Coffman was utterly convinced that could the jaws lock by friction on the guide piece, should this guide include several rods and these rods be automatically bent for clamping. Consequently could the jaws be parallel to each other for clamping, should these ones be leaning towards each other at rest, on the cork pads side, by an acute angle.

No more he seemed to be familiar with the moulding clamp, called "presse-marteau" or "hammer-press", such it has been disclosed page 107, figure 257, in Lombard & Masviel' book, entitled "Cours de Technologie", Band 1 (wood) and published by Dunod & Pinat in 1907 in Paris. This "hammer-press" which belongs to the kind of clamping tools mentioned at the beginning of this prior art review also lock by friction, but its guide piece comprises only one rod and its

jaws are appreciably parallel to each other at rest. This "hammer-press" is also found, always offered made of wood (generally of hornbeam wood), in many commercial hardware catalogues, such as the 1910 one of "Charbonnel et Fils" 's in Thiviers, Dordogne, France, on figure 378 of 40th plate, such as the 1924 one of "Etablissements F. Guitel and Etienne réunis" in Saint Martin street in Paris, on figure 2592 of page 232, and such as the 1927 one of the "Forge Royale" 's in Faubourg Saint Martin street in Paris, figure 306 of 32th plate. Besides the fact that the guide piece comprises only one cylindrical rod, one of the jaws is systematically fixed at one end of said rod and every one of said jaws is lacking any pad, made of cork or something else, but is equipped at the farthest end from the rod in front of the other jaw with a place, where a pad could be precisely sticked on. Moreover, in 1948, the same "hammer-press", with a jaw fixed at one end of the rod and a parallel jaw running on said rod, is presented on pages 27 and 28, in sight of figure 42, with cork pads at this place, by Trillat, teacher of cabinetmaking, in his book entitled "Le Guide Pratique du Métier" ("The Practical Guide for Craft"), published by Fillet & Combe in Bourgouin (Isère, France). Henri Trillat knew the "hammer-press" equipped with cork pads, before becoming teacher of technical education in 1932, as he was an employee in cabinetmaking workshops (as a foreman for furniture manufacturing, at the end). Therefore, he has taught this clamp to his students from 1932. Numerous "hammer-presses" with cork pads can be found in old cabinetmaking workshops in France. A distinctive feature of the "hammer-press", such as it is represented in Trillat's book, is that the straight rod supporting the jaws is circular, whereas in the aforementioned commercial catalogues, the rod is systematically shown with a rectangular section. And this "hammer-press" is hand clamped, as Trillat states it page 83, this time in sight of figure 31 of a revision of his first work, entitled "Technologie Générale et de Spécialité en

Menuiserie-Ebénisterie" ("General and Special Technology in Joinery-Cabinetwork) and published by Dunod, Paris, in 1959. That just shows that the patent applications filed by Ditto in May 1981 (to get the US patent No. 4,555,100) and filed by Pappas in November 1984 (PCT/US85/00420 application) are in large part anticipated (chiefly the Pappas' one, when he is viewing, two thirds of the page 3, that the guide of the jaws might be made up of only one rod). Both are claiming a clamping tool, of which a jaw is required to be fixed at one end of a straight guide piece, the other jaw being running parallel to the first one along said guide piece and remaining parallel thereto at rest, and of which each one of both jaws is equipped at one of its ends, as it is for Trillat's "hammer-press", with an elastic cork-type pad facing the other jaw. They make the difference with respect to the "hammer-press" by splitting up the guide piece into several parallel rods, distributed in length of the jaws, which Coffman however was doing before them. Especially Ditto makes the difference by bringing in wider or deeper pad settings which can be capped upon the original pads and by providing with a recess the rod passage inside the jaws, expecting in this way an improvement of the friction effect for the blocking of the loose jaw against the rod at clamping. Pappas makes really the difference with respect to the "hammer-press" only by claiming a system for hanging said press on wall and bench.

3. and 4. SUMMARY AND ADVANTAGES OF THE INVENTION

The present invention is distinct from the prior art evoked before in what it consists first to make movable and free to be slipped out of the rodspan, the so far fixed jaw of Trillat's "hammer-press". Therefore, not only both jaws are movable, but they are free to be slipped out of the rodspan, unlike the variant shown on figure 2 of Coffman, where both jaws are movable along the rod but remain captive on said rod because of the small bars at the rod ends.

Thus, a clamping device equipped according to the present invention comprises the combination of:

- a cylindrical support part, such as a rod or a tube, with a section circular or not,
- at least two movable and removable arms which can slide along said support part and be turned around it into at least one direction and which can be easily slipped outwards thereof and inwards again,
- at least one buffer secured to one of the arms at a single distance from said support part and having a contact face of which the basis is essentially at right angles to said support part and under which the layer is elastic enough to act as a compression spring.

That gives the "hammer-press" new and considerable possibilities and turns said press into a versatile tool. Indeed not only the new "hammer-press" according to the present invention can be used as a clamp, but also, when the jaws are reversed on the support part, as a holder apart to press against the recess sides, and by adding jaws on same rod, overlapping clamp, which is a new kind of clamp with four jaws providing a spectacularly sturdy and stable clamping, and various types of ample multiple helping hands. By joining end to end with couplers of the electrical connector type and by positioning the jaws accordingly, the maximum opening can be considerably extended. Such connectors, when they are multiple,

enable to get a parallel coupling of the rods to build multicontact vices and to perform multidirectional clamping, possibly one after another, by bending connector bars through short securing upon some rods.

Therefore a device according to the invention can be obtained by the global embodying method comprising the following steps:

a. providing a cylindrical support part, such as a rod or a tube, with a section circular or not,

b. mounting on said support part at least two movable and removable arms which can slide along said support part and be turned around it into at least one direction and which can be easily slipped outwards thereof and inwards again,

c. fitting at least one of the movable arms out with one buffer at a single distance from said support part and having a contact face of which the basis is essentially at right angles to said support part and under which the layer is elastic enough to act as a compression spring.

The present invention can further be distinguished from the prior art evoked before through the replacement of the traditional cork pads by ring buffers elastic on all sides, but with a greater thickness on the outer contact face. There are numerous advantages of ring buffers over cork pads. First of all, there is no more need for a fastening system, such as a sticking, such as a pin and a hole, to secure the pad or buffer to the jaw. Additionally, the ring buffers can receive and support laterally other buffers fitting out others jaws, thereby enabling and facilitating all angular directions of clamping, whatever is the outline shape of the parts to be clamped. And of course, the ring buffers are easily interchangeable with differently contoured ring buffers, to seize for example pieces difficult of access. Thornton (US patent No. 4,834,352) thought for his handle-equipped clamping device of totally surrounding the jaw ends with safety sheaths however under an uniform layer. The purpose of these sheaths was to act as

protecting wedges, but not as an essential for the clamping pressure means, which is materialized by a big pin-shaped spring. In the present invention, the ring buffers are constituting the essential pressure means for the clamping and consistently they are thicker in the clamping direction. That's where the ring buffers are differing from the safety sheaths of Thornton. The difference is all the more marked since Thornton's device is clearly departing from the "hammer-press" concept. It is more like a clothes peg extrapolation towards a large opening with the traditional defects of the clothes peg: jaws diverging from parallel during the clamping operation and force nearly impossible to control because of lever effect. The use of safety sheaths which is otherwise classic (around pliers noses or around fingers with gloves) is not liable to fundamentally alter the performances of the clothes peg. On the contrary, the use of ring buffers, as pads, for the "hammer-press", gives thereto new properties, such as the possibility in conjunction with another "hammer-press" according to the present invention, of clamping in all angular directions with an automatic control of the clamping force, which would be rather difficult with Thornton's press.

A device according to the present invention will be called an assembler for the remainder of the description.

The clamping operation of an assembler, comprising only two arms, consists of pushing the last ones towards each other, with contact face of one arm buffer facing the other arm. The pushing force is translated more or less between the arms in front of the buffer(s). As soon as the resistance against the pushing is felt at the expected level, the pushing is stopped. Then the arms lock on by tipping against said support part as the suspended poles of the ski tow do upon their cable, whether something would be held between the arms in front of the buffer(s) or not. The holding apart is performed according to the same principle. The arms being reversed along the support part, one proceeds in the opposite direction.

The clamping operation is the same when the support part is splitted up into several cylindrical parallel components, distributed not in length of the jaws unlike Coffman, Ditto or Pappas, but at right angles to them, components upon which are sliding only two movable arms.

With an assembler just comprising four movable arms which can be turned in two directions V-diverging about said support part, said arms being fitted out with buffers, the buffers of the first two arms along said part having their contact faces in front of the contact faces of the buffers of the two following arms, the clamping operation is different in the approach of the movable arms, but the locking way remains the same. The two first arms are V-diverging around said support part and are being pushed towards the following ones, more or less positioned according to same V. Roughly the first arm buffer is facing the third arm buffer while the second arm buffer is facing the fourth arm one. As soon as the buffer contact faces are touching the surfaces of the pieces to be clamped and as a sufficient resistance is felt, it is enough to stop pushing. Such a clamping operation has been named "overlapping" and such an assembly of four movable arms on a cylindrical support part has been named "overlapper" or "super-assembler". The overlapping can be used as well for holding apart. The operation is the same except that arms are reversed along the support part. A configuration halfway between a single assembler and an overlapper or super-assembler according to the present invention can be obtained by using two movable arms V-diverging in front of a single third one for the clamping. Depending on the relief of the surfaces to be held, such a configuration might be sufficient.

With the overlapping which offers four contact faces, one can notice a spectacularly more vigourous and stable clamping than with an assembler comprising only two movable arms, even upon tortured patterns. When an overlapper is clamping a small wood plaque upon a

table edge with about 60° as an angle for the V formed either by the first arms or by the following ones, it is extremely difficult to detach said wood plaque from the table, whereas each movable arm only underwent the thrust of one finger extremity during the clamping operation. To perform such a detaching, one hand grabing the small wood plaque with all fingers and drawn itself by a human arm of medium strength is insufficient. On the other hand, it appears that it is quite possible to carry out a stable and efficient clamping even if the four buffers are pressing by their contact face at different levels upon a tortured reliefs. Such a possibility is of course extremely practical for the restoration of gilded artifacts such as frames and cartouches. With the sub-variant of the overlapper comprising only three arms, two first ones forming a V and a third one pressing more or less in front of the middle of the V, one can avoid obstacles which prevent from clamping oppositely. Thus for clamping a foot against the clock pedestal, this foot being opposite a column which stands above the pedestal, the buffers of said movable parts forming the V are taking hold on both sides of said column while the buffer of the opposite movable arm is pressing upon said foot.

If a third couple of movable arms fitted out with substantially elastic buffers is added on the bare portion of the support part of an overlapper grasping the edge of an horizontal bench or equivalent and if said third couple is holding without damage some objects to be painted or to be worked on with free hands, one gets a helping hand. This helping hand is called a third vertical helping hand. If to this third couple of movable arms, called an holder, is added a fourth, a fifth, etc... couple of movable arms, still mounted on the bare portion of the support part, one gets successively one fourth, one fifth vertical helping hand. When each of the added couples of movable parts, also called holders, can be turned in several directions around said support part, these auxiliary hands are even better practical.

Øne can get another configuration of auxiliary hands by mounting along said support part, one behind the other, three couples of movable arms fitted out with substantially elastic buffers, said buffers facing each other by their contact face for each couple. At one end of the support part, the two first couples of movable arms are separately turned and locked by clamping buffer to buffer in two directions diverging with an angle not equal to zero but possibly markedly upper or lower than 90°. Along the remaining portion of the support part, the third couple of movable arms also constitutes a holder to hold objects to be painted or to be worked on with free hands. The so built helping hand is called for the remainder of the present specification a third horizontal helping hand: it can be installed anywhere on a more or less horizontal surface because it rests on three feet: the buffers of the first two couples of movable arms locked at one end of the support part and the other end of the last one. If to this third couple is added a fourth, a fifth, etc... couple of movable arms, still mounted on the remaining portion of the support part, one gets successively one fourth, one fifth horizontal helping hand.

Nota bene: For making the holding by one of the above-mentioned auxiliary hands firmer, one holder can be replaced by one overlapper.

The interest of the auxiliary hands as compared with the traditional helping hands stands at different levels:

- Firstly, the holders that are equipping the auxiliary hands according to the invention cannot with their substantially elastic buffers scratch the held pieces as the crocodile clips of the traditional helping hands can do with their teeth.
- Secondly, unlike crocodile clips these holders are provided with jaw members which can open very widely while remaining parallel to each other.
- Lastly, the auxiliary hands according to the invention are distinctly lighter than the traditional helping hands since they do

not require a heavy pedestal to keep its balance, even when the holders are loaded. Four of the movable arms which are mounted along the support part are sufficient to steady the basis of the auxiliary hand (see above). They are combined in a overlapper which is gripping the edge of a bench or a table, in the case of the vertical helping hands. The buffers of the first four couples of movable arms locked by clamping at one end of the support part are forming with the other end of this one a sustaining tripod, in the case of the horizontal helping hands. That just shows the generic power of the combination: cylindrical support part, movable arms and substantially elastic buffers.

Of course, configurations as the overlapper and the vertical and horizontal helping hands can only be built because of the possibility for the movable arms to turn in several directions around the support part.

The modularity of the assemblers, which is connected to the movability of the arms along the cylindrical support part, is creating a faculty not available up to now with the clamping tools: increasing at will the maximum opening. Said arms can be slipped outwards of their support part (the possible stops at ends thereof are removable) and slipped onto another support part of same section. Cylindrical support parts can be fixed end to end by couplers such as electrical connecting devices, muffs for mechanical pipes or cable links. It matters little that the couplers are barriers against the mobility of the arms between the different support part sections. Putting up one movable part on each of the two extreme sections is sufficient and the maximum opening between the two so used movable arms is inevitably larger than it would be if these two arms would be put up on only one of these support part sections. In this manner the maximum opening according to the invention easily becomes extensible, which contrasts sharply with the traditional clamps where the binding of one of the jaws to one of the end of the support part makes

inconceivable the extension thereof. Naturally, if not one but several movable parts are put up on each of the two extreme sections of the support parts so fastened end to end, it is possible to give a considerable maximum opening to all above disclosed original mountings, as the overlapping, the auxiliary hands, etc... On the other hand, it can be also contemplated to extend a support part with other support parts of different section by couplers the inlets of which being fitted for different diameters (this is the case of connecting devices for big section electrical wires) so as to have facing to each other movable arms with different dimensions. Depending upon the shape of the objects to be clamped, such a mounting can be very useful.

According to a somewhat similar mounting, denominated "radial mounting", on the support part of an assembler including a minimum of two movable arms is secured a coupler fit to seize, in at least one direction distinct from said support part direction another support part which can carry a minimum of one movable arm provided with a substantially elastic buffer. Such a coupler is possibly made of a crosspiece like those which are used in electricity as a shunt contact or those which are used in the Navy or in "Mecano" building set to secure the crossing of two cables or halyards. It might also consist of a little bar of electrical connecting devices which is kept bent for example by the way it is secured on the first of said support parts. If this support part and another of said ones are at an angle of about 90°, it is possible to clamp things by three sides (T clamping) or by four sides (cross clamping). And when the coupler can hold several support parts in directions all distinct from the direction of the support part upon which the coupler is secured, it is possible to clamp things by numerous sides between the movable arms which are carried by said support parts. Such a clamping is then called a radial clamping. Of course said clampings, the T one, the cross one and the radial one, can be operated with movable parts combined in overlappers.

With the radial clamping, it happens to be possible of drawing towards each other the corner sides of a frame and of gripping round objects markedly more firmly.

Another faculty brought by the invention is also connected to the movability of the arms along the cylindrical support part. One of the movable arms of an assembleur comprising just two movable arms fitted out with buffers can be slipped at one of the furthest ends of the support part (the possible stops are removable). If an auxiliary bar, such as a ruler, a tool handle is fastened parallele to a large surface (for example, by means of the holders of two third vertical helping hands according to the invention gripping at opposite edges of said large surface), it is possible with this movable arm buffer to press at any place of this surface along this bar, without any risk for the support part of damaging said surface since it does not go beyond said movable arm. The assembler working as an holder apart, it is sufficient that its other movable arm buffer take support against the auxiliary bar. By reason of this mounting which has been denominated "covering clamping", the jaw depth or projection is made unlimited. The assembler can go as to exert a pressure whatever is the distance from the edge of a large surface, possibly plane, convex, concave or tortured. It is sufficient that the auxiliary bar follows the outlines of the surface, be long enough and positioned in the good direction. For a stronger pressure, the two movable arms might be replaced by an overlapper. Until now this type of mounting by covering was not known to the persons having ordinary skill in the art and was conceivable only with the help of a special tool, a holder apart not much used in the workshops, and of wedges generally difficult to be put in. According to the present invention, this mounting can be easily and directly executed with the very same assembler as the one which enables to perform all the other above disclosed original mountings, provided if needed to add movable arms. It is the multipurpose characteristic of the new assembler.

Another worthwhile feature of the invention, when each of the movable arm is fitted out with a ring buffer, is that the ring buffer belonging to a clamping or holding apart assembler can support against its side, under various angles, the pressure of a buffer carried by a second assembler movable arm. It derives both from antislippery capacity and from malleability of the substantially elastic buffers. Therefore the second assembler in clamping or holding apart position can, with the buffer of one of its other movable arms, force against an object side which is not parallel to another side of said object or against a buffer of a third assembler, also in clamping or holding apart position. Such a mounting enables to clamp even there is no outline easy to be seized, which is often the case of objets d'art to be restored. This mounting was so far very difficult to be achieved with traditional clamps because sizeable and crooked wedges, ever uneasy to be put in and sometimes hard to be found out, had to be jammed under the jaws. Generally such a mounting was requiring more than two hands and brutishly forcing which can be incompatible with the solidity of the objects to be clamped. This mounting turns to be elementary, even under a weak clamping force, with the new assembler, owing to the substantially elastic buffers. It has been denominated angle clamping, staple clamping or bridging clamping, according to the number of assemblers which are brought into play. For a best basis, the supporting assembler possibly can be replaced by an overlapper.

The result of all the foregoing is that the assembler according to the invention is multipurpose and that its general process of use, which enables to hold objects by clamping without damaging them, comprises the following steps:

a. clamping said objects between substantially elastic buffers carried by movable arms arranged along one or several cylindrical support parts and liable to be turned into several directions around these support parts,

b. applying on the back of said arms in the direction of said objects, along said support parts, a thrust and releasing this thrust, so as to lock each of said arms by tilting against the support part along which it is arranged,

c. possibly take as support auxiliary objects put against buffers of the movable arms or against substantially elastic buffers carried by other movable arms arranged and locked along said support parts.

For all variants that have been contemplated until then to the assembler, an additional characteristic may consist in that the support part ends are fitted with removable stops of the type clips, riders, pins, keys, or sections of cylindrical supple sheath slipped on by a gentle forcing.

Other characteristics and advantages of the invention will be more apparent from the following detailed description in view of the attached drawings, upon which:

6. BRIEF DESCRIPTION OF THE DRAWINGS

- FIG. 1 is a sectional elevation of an assembler according to the invention comprising two movable arms wherein only one arm is provided with an elastic slice-shaped buffer.

- FIG. 2 is a sectional elevation of an assembler according to the invention comprising two arms, wherein each of said arms is provided with an elastic slice-shaped buffer.

- FIG. 3 is a sectional elevation of an assembler according to the invention comprising two arms, wherein each of said arms is provided with an elastic ring buffer.

- FIG. 4 is a sectional elevation showing how the assembler of FIG. 2 can be used for pressing an assembly of two objects.

- FIG. 5 is a perspective of an assembler according to the invention comprising four movable arms arranged as an overlapper wherein each one of said arms is provided with an elastic ring buffer.

- FIG. 6 is a perspective of an assembler according to the invention comprising six movable arms arranged as a vertical third helping hand, each arm being provided with an elastic ring buffer.

- FIG. 7 is a perspective of an assembler according to the invention comprising eight movable arms arranged as a horizontal fourth helping hand, each arm being provided with an elastic ring buffer.

- FIG. 8 is a perspective of an assembler according to the invention upon the support part of which are arranged two movable arms and is secured a coupler holding in a direction distinct from the one of said support part another support part carrying two other movable arms each provided with a substantially elastic buffer.

6. BEST MODE FOR CARRYING OUT THE INVENTION

Referring now to Fig. 1 to 8, a multipurpose clamp according to the present invention hence comprises in combination:

- a cylindrical support part 1, such as a rod or a tube, with a section circular or not,

- at least two movable arms 2 which can be slid along and can be turned into several directions around said support part 1, said arms extending themselves therefrom markedly on both sides in a direction mainly orthogonal thereto,

- at least one substantially elastic buffer 3 secured to one of the arms 2 at a distance from said support part 1 and having, opposite from the arm to which it is secured, a contact face of which the basis is essentially at right angles to the support part.

It may be added at least to one end of said support part a stop 4 to prevent the movable arms 2 from freeing themselves when they are not held back on said part by some action.

As it has been said before, a device according to the invention has been denominated an "assembler".

By substantially elastic, it is meant that said buffer 3 is made of an elastic substance, supple like natural or synthetic rubber, foam plastic or cotton, and that its thickness under the contact face is larger than one millimeter. It can be full or spongy structured. It can also be made of a hollow flat box with thin wood, hard plastic of metal walls which have the property of straightening up themselves when is reduced the pressure exerted upon them. Said contact face is more or less flat or slightly bowl-shaped and its seat is mainly orthogonal to said support part. For some applications however, said contact face can be convex. Said buffer can have the form of a slice sticked or an obturator fixed by a spike on said movable arm or the form of a ring slipped onto same arm at a distance from said support part. The advantage of a ring as a buffer as compared to a slice or an obturator is its capacity to be fixed on said arm without

needing sticking on or boring an opening through said arm. Its internal dimensions must only be smaller than or at the most equal to said arm external dimensions at the place where it has to be fixed, so that it can be forcibly slipped on the arm to said place and stay locked thereon.

According to another arrangement, the buffer is made up of a pile of substantially elastic slices in the way of a Belleville washer spring; in a first subarrangement, slices are sticked one on top of the other; in a second subarrangement, slices are pierced and slipped on top of the other too by a gentle forcing onto a second cylindrical part which is parallel to said support part. Said second cylindrical part is slidingly mounted behind said buffer contact face through the arm which carries said buffer and is held back by a stop similar to the ones with which the ends of said support part can be fitted out.

One of said means to allow one of said movable arms 2 of sliding along said support piece 1 is constitued by a passage hole, of which inside form surrounds as near as makes a small play the outline of said support part 1. But such a means may also consist in a stirrup annexed to said arm 2 side, said stirrup forming a loop; another possibility is to shape said passage hole in building up each of said arms 2 by assembling side by side two half-arms each provided within its thickness with a cylindrical semicircular groove, the groove hollow of each half-arm facing the groove hollow of the other half-arm; a similar possibility is to put in each whole arm side, within its thickness, a cylindrical groove and to close this one longitudinally by a plate; it can also be

considered of wrapping a tenon piece of said arms by a hollow rail constituting said support part.

Referring to FIG. 1 to 8, each stop 4 is composed by a section of cylindrical supple tubular sheath the diameter of which being slightly smaller than the average diameter of said support part. Said section is slipped on at end of said part by a gentle forcing. Such stops can also consist in clips, riders, pins or keys. But as compared to these last means, using some supple sheath to slip by force onto a tube is an especially economical means, since no machining of said cylindrical support part and no special tools for manufacturing said stops are required even if said support part section is out of standards. Such a sheath can be found easily, for there is no special requirement, allowing for exceptions, of resistance to temperature rise or to environment aggessiveness. Only said sheath section must be a little smaller in diameter than said support part in the average and said supple sheath must keep its elasticity in the course of time with normal environmental conditions. Can be suitable for: supple tubes of PVC, medium or low density polyethylene, silicone, natural or synthetic rubber.

FIG. 1 shows an assembler according to the invention including only two movable arms 2. A single substantially elastic buffer 3 is involved. It consists in a slice adhering to its carrying movable arm 2 by sticking or by a spike which has been made penetrated by force into a hole bored in said arm 2.

As for FIG. 2, it shows an assembler according to the invention including only two movable arms 2 where two substantially elastic buffers 3 are employed, one per

arm. Each of these buffers consists in a slice adhering to its carrying arm 2 by sticking or by a spike which has been made penetrated by force into a hole bored in said arm 2.

As for FIG. 3, it also shows an assembler according to the invention including only two movable arms 2 where two substantially elastic buffers 3 are employed, one per arm. But each of these buffers consists in a ring of rubber or other material or an equivalent plastic alveolate structure slipped by forcing onto its carrying arm 2.

In view of FIG. 4, to operate a clamping with an assembler according to the invention and including only two movable arms, it is enough of:

- bringing the set of the objects 8-9 to be clamped between the tool arms 2, opposite the contact faces of the substantially elastic buffers 3;

- pushing with fingers or the hand palm upon the backs of the arms 2, on the reverse side of said contact faces, in direction of said objects 8-9.; arms 2 then slide along said support part; as soon as said contact faces are touching said objects 8-9 by the surfaces to be held, the fingers are feeling a resistance as if they were directly pushing on said objects: it is the resistance exerted by the objects 8-9.

- going on to push upon backs of arms 2 while increasing pressure so as to compress the buffers;

- As soon as the hand is feeling that has been reached the force sufficient to suitably clamp said objects against each other together, stopping to pusch; movable arms 2 are locking on then automatically and instantly by

tipping against said support part as the suspended poles of the ski tow do upon their cable.

It is worth noting that an assembler according to the invention performs as a relay of the human hand or hands (in the sense of replacing) for the accomplishment of a task like clamping. It can actually keep a clamping position as long as it is needed under the same effort the hand(s) can temporarily hold.

A single pushing upon the opposite part from the backs of said arms 2 on the other side of objects 8-9 across said support part 1 is enough to unlock said arms 2 and to release from clamping the set of objects.

The holding apart operation with an assembler according to the invention including only two movable arms is performed in a similar way. However, the arms must be beforehand reversed along said support part so as to turn the contact faces of said buffers towards the outside. The objects to be held apart are first brought above and below the tool movable arms 2, opposite the contact faces of buffers 3. The operation is then going on as does the clamping operation as soon as the fingers or the hand palm begin to push upon the back of said arms, except that the force to manually feel is the one with which it is wanted to hold apart.

FIG. 5 shows a variant of the assembler including only four movable arms, said arms being fitted out with substantially elastic buffers 3, the buffers of the first two arms 2a and 2b along said support part 1 having their contact faces in front of the contact faces of the buffers of the two following arms 2c and 2d. The first two arms 2a and 2b are turned in two directions V-diverging about said support part and are facing the two

following arms 2c and 2d, more or less arranged according to same V. Roughly the buffer 3 of first arm 2a is facing the buffer of third arm 2d while the buffer of second arm 2b is facing the buffer of the fourth arm 2c. As it has been told above, such a configuration has been given the name of "overlapper" or "super-assembler" and the clamping operation which consists in moving closer the two V, the name of overlapping. It is enough to push upon the backs of the movable arms along said support part 1 towards the objects to be clamped. As soon as the buffer contact faces are touching the surfaces of said objects and as a sufficient resistance is felt, it is enough to stop pushing. The movable arms 2 are then locking clamped onto said objects still by tipping against said support part. The overlapping can be used as well for holding apart. The operation is the same except that arms are reversed along the support part. A configuration halfway between a single assembler and an overlapper or super-assembler according to the present invention consists in using two movable arms V-diverging in front of a single third one for the clamping. Depending on the relief of the surfaces to be held, such a configuration might be sufficient.

As for FIG. 6, a third couple of movable arms 2e-2f, denominated an "holder" is added on the bare portion of the support part 1 of an overlapper comprising two couples of movable arms 2a-2b and 2c-2d grasping the edge of an horizontal bench or equivalent. Said third couple arms are fitted out with substantially elastic buffers. Such an holder can hold some objects to be painted or to be worked on with free hands. Such a configuration has been given before the name of third vertical helping hand. A holder is used as an assembler comprising two

movable arms for the clamping and holding apart operations.

FIG. 7 shows another configuration of auxiliary hand: a fourth helping hand labelled "horizontal". It includes four couples of movable arms 2a-2b, 2c-2d, 2e-2f, 2g-2h, mounted one behind the other along said support part. The movable arms of each couple are fitted out with substantially elastic buffers 3, said buffers facing each other by their contact face for each couple. At one end of the support part, the two first couples of movable arms 2a-2b and 2c-2d are separately turned and locked by clamping buffer to buffer in two directions diverging with an angle near to 70°. Along the remaining portion of the support part, the third couple of movable arms 2e-2f and the fourth couple of movable arms 2g-2h are constituting "holders" to hold objects to be painted or to be worked on with free hands. Of course the buffers of the two first couples of movable arms 2a-2b and 2c-2d locked at one end of the support part are making up with the other end of this one a tripod. Each holder can be used as an assembler comprising two movable arms for the clamping and holding apart operations.

Nota bene: For making the holding by one of the above-mentioned auxiliary hands firmer, one holder can be replaced by one overlapper.

FIG. 8 is showing a "radial mounting". On the support part 1 of an assembler according to the invention is secured as a coupler a pliable little bar 5 of electrical connecting devices which is has been bent. Said support part 1 is carrying two movable arms 2a-2b, both of them being fitted out with substantially elastic buffers 3. Said bar 5 is bent for it is secured on said support part

1 by two normally far from each other contacts 6 and 6a which have been brought closer by torsion of the little bar within its medium plane. These contact screws are tightened upon support part 1, i.e. they are jammed on it. The contact 7 of the little bar is seizing, still by screwing thereon, another cylindrical support part 1a upon which are put two other movable arms 2c-2d, both of them being fitted out with substantially elastic buffers. The first support part 1 is about at right angles with the other support part 1a. The clamping operation for each couple of movable arms 2a-2b and 2c-2d is identical to the operation for an assembler according to the invention including two movable arms. In this way, as illustrated in FIG. 8, it is possible to clamp things by four sides between the movable arms which are carried by these two support parts. Such a clamping has been given the name of cross clamping. It would be also possible with some additional cylindrical support parts held by other contacts of the little bar and carrying each at least one movable arm of clamping things by a vast number of sides, which is a radial clamping. In the same way, on second support part 1a can be secured another coupler holding a third support part 1b in a direction distinct from the directions of the first two support parts, and possibly one more coupler can be secured on this third support part, and so forth to build a chained radial mounting. Such a chain configuration might be helpful to clamp the objects with complicated outlines. Another model of coupler can consist in a crosspiece including two or more pipes which are diverging and which can hold captive by a screw system or another one a support part like a rod or a tube. This kind of crosspiece is used in electricity as a shunt contact. Crosspieces are employed

too in the Navy or in "Mecano" building set to secure the crossing of two cables or halyards. Some of them made of sheet metal or plastic are meant to enclose electrical shunt boxes. The little bar as a coupler may be replaced as well by juxtaposing in force, hollow to hollow and according to different directions, several uniform section structures similar to those which are used to build exhibition stands and display cases.

In another arrangement of the assembler according to the invention including only two movable arms 2, the support part 1 is splitted up into several cylindrical parallel components, which are constituting in fact so many parallel and homogeneous support parts. Said components are made interdependent at each of their ends by couplers which can be some little bars of electrical connecting devices or the like when said components have very nearly the same diameter. One of the arms might be fixed upon these components. Both arms have a wide pressing face. In a first kind of subarrangement, the substantially elastic buffer 3 carried by one or each of both arms is formed of one piece; In a second kind of subarrangement, the substantially elastic buffer 3 carried by one or each of both arms is splitted up into several pieces; in this case, said pieces are located at a single distance from the median plane in which are situated the different cylindrical components of said support part; one might let said pieces work independently of each other or sandwich them between the arm which is carrying them and a rigid linking plate destined to act as a jaw towards objects to be clamped. The sandwich configuration with several elastic buffer pieces put between the arm which is carrying them and a rigid plate turns out to provide a firmer clamping than the single buffer configuration for the same compression force. Of course, this implies a synergetic effect. In the second kind of subarrangement,

when the buffer is splitted up into several pieces, the arm might be itself splitted up into several blocks each carried by one or several components of the support part. As said components are constituting so many parallel support parts, it is as if several assembler according to the invention were coupled together in parallel to make up a multipoint vice.

It is worth noting moreover that the device according to the invention might find many applications such as fixing apparatus to a support when said apparatus is made interdependent of or is constituting one of said arms.

It stands to reason that this invention was only described and illustrated on a purely explanatory and not in the least restrictive basis and that it will possible to make any variant of it without getting off its scope.